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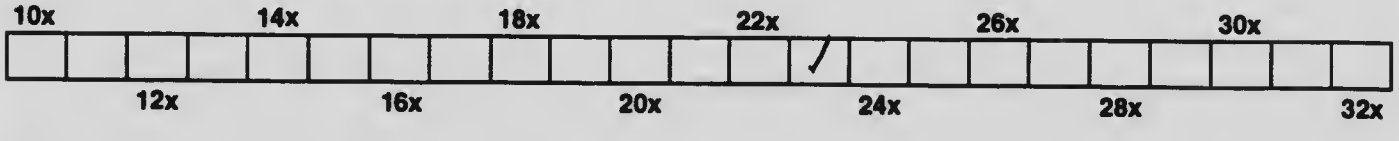

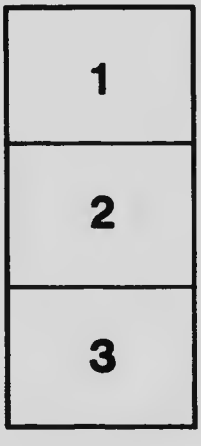

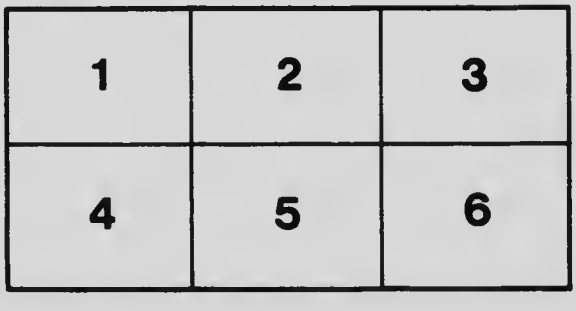

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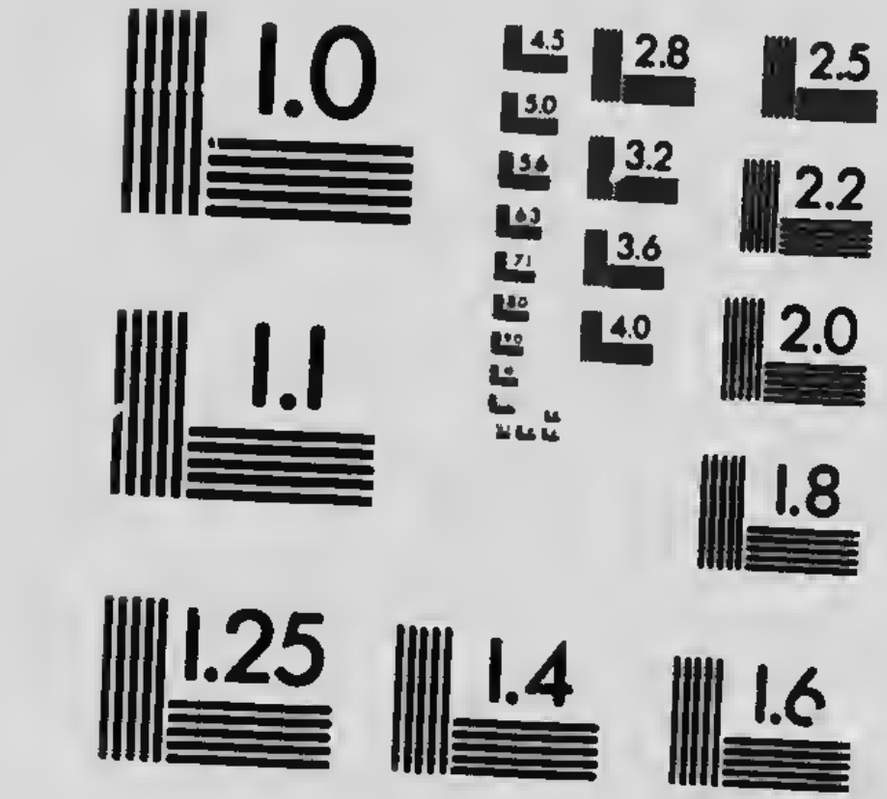

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Circular No. 26

Control of Insect Pests

In Manitoba

Manitoba Agricultural College
Winnipeg, Canada

Published by the authority of
Hon. Geo. Lawrence, Minister of Agriculture and Immigration

AGRICULTURAL COLLEGE,
Winnipeg, Man.
October 23rd, 1914

Hon. George Lawrence,
Minister of Agriculture,
Winnipeg.

Sir:—

This circular is a reprint of a paper delivered by C. Gordon Hewitt, D. sc., before an Annual Meeting of the Manitoba Horticultural and Forestry Association at the Agricultural College. As it contains much information of value to the farmers of Manitoba I recommend its publication.

W. J. BLACK,
President

Control of Insect Pests in Manitoba

The subject under consideration is of so great an extent that, even limiting myself to a consideration of the insect pests affecting the horticultural and forestry interests in the province of Manitoba, it will be necessary to touch but lightly on the more important of these pests.

Few people realise the enormous ravages which our insect pests commit in the aggregate. Occasionally a sudden outbreak attains a sufficient magnitude to attract the serious attention of the farmer and through the press, the public, as in the case of the grasshopper outbreak in certain sections of Manitoba about thirteen years ago. As a rule, however, the insects work almost unobserved. Every farmer, nevertheless, must notice that a certain proportion of his garden crops, his field crops and his wood-lot suffers each year from the attacks of insects. While the proportion of his crops destroyed in some instances may be small, in others it will be greater and he will realise, if he will only give the matter a few moments' thought, the immense toll which insects take in the aggregate from the total amount produced. Careful observations extending over a series of years have shown that insect pests destroy on the average from ten to twenty-five per cent of the total crops, both of the farm and of the forest. Taking the lowest of these estimates, which is, in my opinion, a low estimate for the cultivated sections of this province, and assuming that only ten per cent. of the field crops are destroyed, you will find that the total value of field crops destroyed each year in Manitoba by insect pests is surprisingly great. Using the official returns of the Department of Agriculture for Manitoba, it will be found that, on a ten per cent. basis, the total destruction of field crops alone by insect pests in Manitoba in 1911 (which are the last returns I have) amounted to nearly eleven million dollars. That you must remember is based on the lowest estimate of insect injuries. Wheat is the valuable field crop in Manitoba; but in 1911, insect pests took at least five and a half million dollars out of the pockets of the grain-growers. That is the normal loss which goes on from year to year, the loss increasing in proportion to the increase in production. Let there be a serious outbreak of an insect pest, however, and the loss is much greater, for, in addition to the amount destroyed, there

is the expense of re-seeding and its accompanying cultivation. An actual instance will illustrate what I mean. Last year, cutworms were very destructive in Southern Alberta and our inquires show that about thirty-five thousand acres of grain were destroyed altogether. The value of those thirty-five thousand acres of grain does not nearly represent the actual financial loss, for it does not take into account the fact that many of the farmers, not only re-seeded, but lost the second crop also.

What is the lesson that these statistics regarding the losses due to insect pests teach? It is this, that it behaves us not to lose sight of so potent a fact as they constitute tending to diminish the production of the farm or of the forest, our greatest and most valuable national assets. An insect is a small creature; its work is often insignificant, but increase it a million fold, provide it with abundance of food and it may become as devasting in its effects as an invading army. It is manifest that all efforts to increase production, to make two or even more blades of wheat grow where one grew before, should be accompanied by equally determined efforts to prevent or control those causes which so effectively reduce production.

As new areas are brought under cultivation, new fields of activity are provided for the insect pests no less than for the settler. Insects formerly content to feed in comparitively restricted numbers on native grasses and vegetation now find a land, flowing as it were, with milk and honey; they invade these new areas, increase and multiply and deprive the farmer of the fruit of his toil. As an example, I might say that we have reason to believe that the damage caused by cutworms in Alberta, to which I have referred, has been largely due to a native species which had not been previously recorded or recognised as a pest. Further, these new areas of settlement and cultivation not only provide food for native insects but new lands for invasion on the part of insect invaders, which are constantly extending their field of operations as opportunities in the way of new lands facilitate their spread and increase. The effect of such insect invasions is immediately to increase the cost of producing the crop. One example of many which I might quote will illustrate my meaning. The Colorado Potato Beetle, Leptinotarsa decemlineata, which entered Canada by way of Ontario in 1870, reached Manitoba some years ago by natural spread. What have been the results of this invasion? The result has been an increase in the cost of growing potatoes, an increase due to two facts, first, the direct loss due to the

destruction of the potato vines and second, the cost of preventing this destruction entailed by spraying. The Potato Beetle can be controlled but its control increases the cost of production. Grasshoppers, root maggots and other insects to which I shall refer later, can all be controlled but their control increases the cost of production and the losses due to their presence and non-control has the same effect, with the difference that the loss is greater where no control is attempted.

One of the most serious problems engaging the attention of the people of Canada to-day is the high cost of living. You may be wondering what have insect pests to do with the high cost of living? Their relation is more direct than you may imagine. We know that one of the chief contributory causes of the high cost of living is the increased cost in the production of our food products. It costs more to-day to produce a ton of clover, a pound of beef, (beef is merely converted field crops), a bushel of potatoes or a barrel of apples than it did some years ago. This increased cost in production is due to a number of factors but, as I have shown, important factors in many cases are the cost of controlling and the losses resulting from insect pests. As illustrating the cost of controlling insects, the average cost of spraying fruit trees to control injurious insects is about fifteen to twenty-five cents per tree; the expense entailed in controlling the potato beetle by spraying works out approximately at five cents a bushel.

What is to bear this added cost? While the farmer has, in many instances to stand the loss entailed by insect attacks, owing to the general market price being fixed, we know that as the producer he does not stand, and rightly so, the increased cost of production. The consumer is called upon to meet that expense, together with other expenses, which like barnacles attach themselves to the cost of the produce on its voyage from the farmer to the consumer. I think you will agree with me, therefore, that the problem of insect control is related, like other factors affecting production, to the cost of living.

I may seem to have wandered somewhat from the subject of my address. My desire has been, however, to impress upon you the necessity of realising in its true light the bearing which the problem of insect control has on the question of production and land development, whether the land be agricultural or forest. If we are to utilise correctly our agricultural and forest resources, which is the very essence of the conservation of our natural resources, we must not neglect factors which prevent us

from obtaining what the soil is capable of producing. Insects constitute, as I hope I have shown, such adverse factors. Their prevention and control is therefore an essential part of good husbandry and of efficient forest management.

Turning to a consideration of the measures essential to insect control, we may divide them into two groups, namely preventive and eradicative. But before either of these measures be employed a knowledge of the existence and nature of one's adversary is necessary and this is where the assistance of the Entomologist is invoked. When the habits of the insect are known and when its methods of attack and the weak and susceptible points of its life-history are discovered, then, but not till then, can we consider methods of control.

Methods of prevention resolve themselves into three classes, namely preventing the introduction of the pest when that is possible, preventing the increase or spread, and the actual protecting of the plants. A pest may invade a new territory, either by natural or by artificial means. The Colorado Potato Beetle is an example of a destructive pest which has spread naturally, its native home being certain Solanaceous plants in the state whose name distinguishes it. The pests which have been introduced into the North American continent (for, in these questions, our lengthy southern land frontier renders it necessary to regard Canada and the United States as territorially one and the same, be they ever so distinct in other regards) constitute at least half of our serious pests. Certain of them, such as the San Jose Scale, the Gipsy and Brown-tail Moths, the Hessian Fly and the Mediterranean Flour Moth, the last two being known more particularly in this part of Canada than are the former,are the most serious pests with which we have to contend in their respective spheres of action. The artificial introduction of some of these could have been prevented, but not of all. We learn by experience. The introduction of the San Jose Scale was responsible for the passing of our first Dominion Insect Pest legislation, enacted with a view to preventing its further introduction. Three years ago a more comprehensive measure, the Destructive Insect and Pest Act was passed; this Act gives the Minister of Agriculture power to take such steps as he may deem necessary to prevent the introduction into and spread within Canada of dangerous insect pests. Under it practically all trees and other plants which are liable to introduce insect pests, or insects which might become pests in this country, are either fumigated at our fumigation stations

established along the frontier from East to West o. are inspected individually. Manitoba is protected by our fumigation and inspection station located here in Winnipeg and during the importation season of 1911—1912 at this Winnipeg Station, which serves as the port of entry for the provinces of Manitoba, Saskatchewan and Alberta, over one and a quarter million fruit seedlings and trees, ornamental shade trees, shrubs and other plants of like character were fumigated and about 60,000 trees and plants were individually inspected. The protection against foreign insect pests which this inspection and fumigation provides will be apparent to all. In view of the increasing amount of trees and other nursery stock imported into western Canada, all of which at present is required to be shipped via Winnipeg for fumigation there, the Minister of Agriculture, Hon. Martin Burrell has decided to establish an additional port of entry which will be located in Southern Saskatchewan and a fumigation and inspection station will be located there. Arrangements to that end will be made during the coming summer. The provision of an additional port of entry for the large number of trees which we are compelled to import from our neighbors to the South should result in a further extension of the planting of shade and ornamental trees in the provinces of Saskatchewan and Alberta, which will be benefited by the additional facilities provided. From the foregoing statements the extent of our activities with a view to preventing the introduction of insect pests will be understood.

Let us now turn to the second method of prevention, namely the prevention of the increase and spread. It is here that the farmer takes the matter into his own hands and upon his action or inaction the question of control will, in the majority of cases, depend. The most important of all preventive measures is clean cultivation. Even in fighting insect pests, cleanliness is the greatest of earthly virtues. Insect pests, like disease, flourish in the absence of cleanliness. Everyone knows what is meant by clean cultivation and clean farming, but it is far from being generally practiced. Fences should be kept clean and clear of weeds, you then cut down the supply of weed seeds and of food for insect pests waiting for your next crop. The refuse after a field crop such as cabbages, turnips, beets, corn or other hoed crop should be disposed of and as soon as possible after the crop is removed. The remnants provide food and shelter for the enimies of the crop. Volunteer crops, that is, young plants springing up after the crop has been harvested, should be destroyed; these frequently carry

insects, such as the wheat stem-maggots, over to the next crop; on that account such volunteer crops may be sometimes used as bait crops. Clean up after threshing, burn the screenings and other refuse; if this is done, there will be less Hessian Fly injury and consequently a greater yield. This list of cleanly habits might be continued to a very great length but that should not be necessary, the farmer should know that a clean farm means fewer insect pests and fewer weeds, the miller should understand that a clean mill means less grain-moth and weevil, the fruit grower should appreciate the fact that a clean orchard results in fewer insects and better fruit, the housewife will find that a clean back yard means less flies and a clean house less fleas. Everyone knows that "prevention is better than cure", that is why it is so seldom heeded, because "familiarity breeds contempt."

A method of prevention, upon which I cannot insist too strongly, is the protection and encouragement of insectivorous birds. Your President has, I believe, already addressed this or a sister convention on the economic value of some of your birds. If every farmer would endeavour to protect the birds on his farm and encourage their visits there would be less damage by insects. Birds are the best insect-destroying agencies we have, and the destruction of insectivorous birds is an unpardonable crime for which any farmer so responsible deserves to suffer incessant damage to his crops. Our birds are, of all our fellow creatures, our greatest friends and allies in this constant war against the enemies of our crops and of our forests; let us treat them as we would our human friends.

Regarding the third method of prevention, namely the protection of the plants themselves, this almost merges into what I am calling the second of the chief methods of insect control, namely the eradicative or remedial measures. As I shall show in referring to the individual pests, we can frequently protect the plants or crops from insect attacks before any damage has been inflicted.

The second of the two chief methods of insect control is that of eradication. Here we pass from the realm of generalities to the sphere of specific remedial measures. Insects, like all other animals, have their peculiar habits which are as diverse as the forms and characters of the insects themselves. In the succeeding account, I shall briefly refer to the chief means which may be employed in eradicating the chief insect pests of horticulture and forestry in Manitoba. Of the insects which are

injurious to horticultural interests in the province, probably the most serious are grasshoppers, root maggots, cutworms, Colorado potato beetle and sporadically, the blister beetles. These insects are too well-known to require description and the best methods of prevention and eradication are also becoming more generally understood.

The best means of protecting against grasshoppers is the Criddle mixture, devised by Mr. Norman Criddle, to whom the agriculturalists of this province owe a lasting debt of gratitude. The basis of this mixture consists of horse droppings for which grasshoppers have a decided liking. Sixty pounds of horse droppings are poisoned by mixing in one pound of Paris green; two pounds of salt dissolved in half a pail of water are added and the whole is thoroughly mixed in a barrel. This mixture is scattered broadcast round the infested or likely to be infested crop or field. Grasshoppers are also destroyed by means of hopper-dozers which are devices for catching them as the trough-like hopper-dozers are dragged over the infested fields.

Root maggots are small white maggots frequently found in the roots of cabbages and cauliflowers, in radishes and turnips. Other species are found in onions, beans and corn. Where these occur, such crops as cabbages and cauliflowers may be protected by means of small tarred felt-paper discs placed round the stems of the plants when they are planted out. These discs prevent the adult flies from depositing their eggs on the roots of the plants. In the case of onions and radishes, we have found, as a result of three years experiments, that the most effective preventive measure was watering the plants every seven or ten days with hellebore decoction made by mixing two ounces of hellebore to every gallon of water.

Cutworms, those deadly enemies of young plants, cutting them off near the root in the shelter of night, hiding in the soil during the day, are most readily destroyed by means of poisoned bran mash. This mixture is made by slightly moistening fifty pounds of bran with water, preferably sweetened a little with molasses, and mixing in a half a pound to a pound of Paris green. The mixture should not be too moist but should be dry enough to crumble through the fingers. Individual plants are protected by sprinkling a little of the poisoned bran around them. In the field it may be scattered broadcast from a cart or distributed by means of a seeder. Traps made by poisoning green vegetation, such as clover, by spraying it with an arsenical poison, may be placed where the cutworms are

abundant. Young plants may also be protected by placing small cylinders of tin, about 2½ inches in diameter, around them. Clean cultivation and the destruction of weeds and rank vegetation are most important adjuncts to the successful control of cutworms.

The Colorado potato beetle can be successfully controlled by spraying the potato vines, from the time they appear above the ground with the full strength of Paris green or lead arsenate combined preferably with Bordeaux mixture.

Blister beetles sometimes appear in swarms and attack garden crops. They are usually associated with grasshopper outbreaks, as the larvæ of certain blister beetles feed upon the eggs of grasshoppers and in that respect are useful insects. In certain cases the beetles may be driven from the crop and unless they return no further damage will be effected. Should they be unusually injurious, they can be controlled by spraying with an arsenical spray the plants they are attacking.

The most noticeable of forest insects in Manitoba is the larch sawfly, which has destroyed the native tamarack in many localities in the province. About a quarter of a century ago it destroyed the greater part of the tamarack throughout eastern Canada. A second outbreak occured in 1905 and has spread westward. In a case of this kind, where the insect is spread over hundreds of square miles, artificial methods of control which might be employed where only a few ornamental trees or a small area attacked are out of the question. In such a case we are compelled to rely upon the natural enemies of the insect, such as the insect parasites and disease, to increase in sufficient proportions to control the pest. In the case of the larch sawfly we find that its natural enemies in Canada are not sufficient to control it. In one case only has an insect enemy been found that might conceivably control it where the parasite occurred This was a minute black four-winged insect about one-twelfth of an inch in length which laid its eggs in the cocoon of the sawfly. In my studies of this parasite I found as many as 73 larvæ of the parasite in a single cocoon of the sawfly and as it has a number of broods annually its rate of increase will be appreciated. This parasite, however, has not been found to be widely spread. In order, therefore, to increase the number of the natural enemies of the sawfly we have been endeavouring during the past two years to introduce from England certain parasites which I had found of importance in the natural control of the larch sawfly in that country. A year ago, a con-

siderable number of the cocoons of the sawfly infested with its parasitic enemies, in particular with a species of Ichneumon (Mesoleius tenthredinis) were imported from England and distributed in the Riding Mountain Forest Reserve in this province. If we can successfully import and colonise some of the enemies of this serious forest pest, we shall at least be in a better position in regard to the possibilities of its natural control.

All who are interested in forestry and in the conservation of our forests will be interested to know that we have now seriously undertaken the study of the insect enemies of our forests.Last year Mr. J. M. Swaine, the Assistant Entomologist who has charge of the forest insect investigations of the Division of Entomology, investigated the forest insect conditions in the province in the Riding Mountains. He found that the bark-beetles, which of all forest insects are the most injurious to forest trees, were present in great numbers in sections where the timber had been injured by fire. It should be pointed out that these small dark-brown beetles which excavate tunnels sometimes of marvelous design in the inner bark of living or dying trees are frequently the cause of the death of trees supposed to have died from the results of a fire or other cause. A fire-swept area may recover from the effects if the trees have not been too seriously injured but if such trees weakened in vitality, are attacked as they frequently are, by bark-beetles, they are killed; the uninformed observer naturally concludes that they have been killed by this fire. The importance of recognising the presence of these bark-beeties in the early stages of an outbreak is extremly great as such early recognition will enable the forester to take measures to prevent the further spread of the insects and the infestation of a greater area of timber. It has been found that not only can bark-beeties be controlled but that they can be controlled at a profit

In many parts of the province the boring grubs of the long horned beeties, known as Cerambycidæ are very injurious to poplar. The only method of controlling these borers is to cut and burn all infested trees at the correct season. During the past two or three years the willow leaf beetle, Galerucella decora has been very abundant in certain parts of Manitoba and has seriously defoliated willows, aspens and poplars. It can be controlled by spraying the trees with an arsenical solution but this is hardly feasible except in the case of ornamental trees Its natural enemies may increase in sufficient numbers to control it as is usually the case with many of our native insects.

While the foregoing remarks have been distinguished by their brevity, I trust that I have indicated the manner in which our investigations and their application can be, and of necessity are of a value not to be counted in dollars only but in relation to the increased productiveness of the land and the diminished destruction now taking place in our forests.